Salt Lake City, Utah, in the afternoon. By the evening of the 24th this low area had moved southward to Kansas, rain fell in the western lake region and the middle and upper Mississippi and Missouri valleys, and snow continued in the extreme northwest.

During the 25th the low area remained nearly stationary over Oklahoma, with pressure about 29.50 at the evening report, rain fell generally over the interior of the country, unusually well-defined tornadoes occurred in the evening in Oklahoma and northeastern Texas, and thunderstorms were noted thence over the lower Missouri, middle Mississippi, and lower Ohio valleys. By the evening of the 26th the center of disturbance had advanced to the extreme upper Mississippi valley, with pressure below 29.50, rain had fallen from the interior of the Gulf and south Atlantic states over the Lake region and the Northwest, thunderstorms were reported in Arkansas, Indiana, Alabama, and Lower Michigan, and heavy winds prevailed over the Great Lakes. During the 27th this low area passed slowly northeastward over Lake Superior, with pressure below 29.40 at the morning report, the rain area contracted to the Saint Lawrence Valley and the New England States, and high west winds continued over the Great Lakes. By the evening of the 28th the low area had disappeared over the Gulf of Saint Lawrence.

VIII.—Appeared central over the middle plateau region the morning of the 27th, to which position it had apparently advanced from the southward, and by the evening of that date had passed eastward over Colorado, with pressure below 29.70, and rain along the middle and west Gulf coasts. During the 28th this storm moved southeastward to Oklahoma, with rain in the upper Mississippi valley, snow in the Northwest, very destructive tornadoes in north-central Texas and Oklahoma in the evening, and heavy rain and hail storms in Missouri. During the 29th this low area moved northeastward, and at the evening report a trough of low pressure extended from the middle Atlantic coast to Texas. On that date rain fell over the northern and central districts east of the Rocky Mountains, snow was reported in the middle Rocky Mountain region, and thunderstorms occurred from the middle Mississippi valley to the middle Atlantic coast. During the 30th the pressure continued low from the upper Ohio valley to Texas, rain fell generally in the central valleys, and destructive rain, wind, and thunder storms were reported in the Ohio and lower Mississippi valleys.

*Tabulated statement showing principal characteristics of areas of high and low pressure.*

| Barometer. | First observed. | | | Last observed. | | Duration. | Velocity per hour. | Maximum pressure change in 12 hours, maximum abnormal temperature change in 12 hours, and maximum wind velocity. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Date. | Lat. N. | Long. W. | Lat. N. | Long. W. | | | Station. | Rise. | Date. | Station. | Fall. | Date. | Station. | Direction. | Miles per hour. | Date. |
| **High areas.** | | ° | ° | ° | ° | *Days.* | *Miles.* | | *Inch.* | | | ° | | | | | |
| I | 1 | 51 | 97 | 43 | 73 | 1·5 | 35 | White River, Ont | ·92 | 1 | Quebec, Que | 27 | 2 | Atlantic City, N. J | nw. | 30 | 2 |
| II | 4 | 43 | 99 | 35 | 74 | 1·5 | 42 | do | ·88 | 4 | Swift Current, N. W. T | 25 | 3 | Cleveland, Ohio | nw. | 28 | 5 |
| III | 5 | 52 | 104 | 42 | 72 | 1·5 | 47 | Qu'Appelle, N.W.T | ·60 | 5 | Chicago, Ill | 20 | 6 | Block Island, R. I | ne. | 48 | 6 |
| IV | 7 | 45 | 114 | 47 | 71 | 2·5 | 38 | Miles City, Mont | ·78 | 7 | Pierre, S. Dak | 32 | 7 | Swift Current, N. W. T | s. | 26 | 8 |
| V | 8 | 42 | 124 | 41 | 68 | 3·0 | 42 | Wilmington, N. C | ·28 | 11 | Charlotte, N. C | 20 | 11 | Winnemucca, Nev | sw. | 30 | 8 |
| VI | 13 | 47 | 100 | 47 | 65 | 3·5 | 35 | Moorhead, Minn | ·68 | 13 | Abilene, Tex | 29 | 14 | Hatteras, N. C | ne. | 36 | 17 |
| VII | 15 | 45 | 124 | 33 | 82 | 3·0 | 37 | Calgary, N. W. T | ·30 | 15 | Concordia, Kans | 12 | 16 | Chicago, Ill | sw. | 36 | 16 |
| VIII | 19 | 48 | 86 | 48 | 72 | 1·0 | 27 | Chatham, N. B | ·42 | 19 | Montreal, Que | 11 | 19 | Alpena, Mich | e. | 30 | 19 |
| IX | 21 | 50 | 107 | 38 | 80 | 3·0 | 24 | La Crosse, Wis | ·36 | 21 | Cincinnati, Ohio | 12 | 22 | Bismarck, N. Dak | nw. | 36 | 22 |
| X | 23 | 52 | 115 | 41 | 71 | 3·0 | 32 | Calgary, N. W. T | ·42 | 23 | Helena, Mont | 32 | 23 | Atlantic City, N. J | e. | 32 | 26 |
| XI | 25 | 48 | 111 | 37 | 80 | 2·5 | 34 | Abilene, Tex | ·45 | 26 | Rapid City, S. Dak | 28 | 24 | Rapid City, S. Dak | nw. | 34 | 26 |
| XII | 26 | 51 | 114 | 40 | 106 | 4·0 | 19 | Edmonton, N. W. T | ·24 | 26 | Concordia, Kans | 24 | 28 | Winnipeg, Man | w. | 12 | 28 |
| Mean | | | | | | 2·5 | 34 | | ·53 | | | 23 | | | | 31 | |
| **Low areas.** | | | | | | | | | Fall. | | | Rise. | | | | | |
| I | 2 | 51 | 113 | 48 | 70 | 2.0 | 47 | Chatham, N. B | ·70 | 4 | Rochester, N. Y | 21 | 3 | Winnemucca, Nev | sw. | 56 | 2 |
| II | 3 | 52 | 121 | 37 | 96 | 2.0 | 40 | Swift Current, N. W. T | ·23 | 4 | Valentine, Nebr | 25 | 4 | Fort Canby, Wash | s. | 72 | 3 |
| III | 5 | 44 | 124 | 48 | 71 | 3·0 | 37 | Port Huron, Mich | ·58 | 7 | do | 33 | 6 | Rapid City, S. Dak | sw. | 63 | 7 |
| IV | 10 | 40 | 113 | 47 | 72 | 3·5 | 29 | Pueblo, Colo | ·62 | 10 | Dodge City, Kans | 21 | 11 | Amarillo, Tex | w. | 66 | 11 |
| V | 13 | 33 | 100 | 43 | 67 | 2.0 | 42 | Lynchburg, Va | ·32 | 14 | Chattanooga, Tenn | 10 | 14 | Galveston, Tex | nw. | 54 | 14 |
| VI | 17 | 37 | 102 | 46 | 80 | 5·0 | 16 | Toledo, Ohio | ·58 | 20 | Pueblo, Colo | 17 | 17 | Detroit, Mich | ne. | 72 | 20 |
| VII | 22 | 50 | 115 | 49 | 70 | 5·5 | 26 | White River, Ont | ·64 | 26 | Buffalo, N. Y | 18 | 26 | Huron, S. Dak | se. | 56 | 23 |
| VIII | 27 | 40 | 113 | 37 | 93 | 2.0 | 27 | Dodge City, Kans | ·40 | 27 | Pueblo, Colo | 23 | 27 | Chicago, Ill | ne. | 53 | 30 |
| Mean | | | | | | 3·1 | 33 | | ·51 | | | 21 | | | | 61 | |

## NORTH ATLANTIC STORMS FOR APRIL, 1893.

[*Pressure in inches and millimeters; wind-force by Beaufort scale.*]

The paths of storms that appeared over the west part of the north Atlantic Ocean during April, 1893, are shown on Chart I. These paths have been determined from reports of observations by shipmasters received through the co-operation of the Hydrographic Office, Navy Department, and the "New York Herald Weather Service."

Over the north Atlantic Ocean the April normal pressure is highest in a belt extending from the west coast of Africa between the 20th and 30th parallels south of west to the 50th meridian, where it is above 30.10 (764), and is lowest in an area which occupies Iceland and southeast Greenland and the ocean thence to the 50th parallel, where the values fall below 29.80 (757).

The principal track of April storms is traced from Nova Scotia eastward to the 40th meridian, where it divides, one branch passing to Iceland and the other to the region west of Ireland. From the ocean west of the British Isles one class of storms passes southeastward over the Bay of Biscay and another to the north of Scotland. An average of 1.5 storm per month traverses the ocean from coast to coast in April. The average velocity of April storms over the north Atlantic is about 20 statute miles per hour.

The severest storms noted for April, 1893, occurred over the western part of the ocean on the 1st, 2d, 5th, and 18th, and over mid-ocean north of the Azores on the 18th. From the 8th to the 16th the pressure continued low in the region of the Azores, and high pressure obtained over and near the

British Isles. The pressure was also high over the British Isles from the 2d to 4th and 28th to 30th.

The month opened with a severe storm central south of Newfoundland, where the pressure fell to about 29.00 (736), and northwest gales of hurricane force were encountered. By the 2d this storm had moved east of the Grand Banks, and a second storm had advanced from the Saint Lawrence Valley to a position south of Newfoundland. By the 3d the storms had united and occupied mid-ocean north of the 50th parallel, where the pressure continued low during the 4th, after which the storm-center disappeared north of the region of observation. During the 5th low area I passed eastward over Newfoundland, with northwest gales of force 11 to 12 in the trans-Atlantic tracks between the 55th and 65th meridians during the early morning. By the 6th this storm had passed northeastward beyond the region of observation.

Reports of the 8th showed the development of a storm of marked energy east of the Banks of Newfoundland, where gales of hurricane force were encountered during that date. Reports of that date also indicated the presence of a disturbance southeast of the Azores. On the 9th 3 well-defined storms appeared, one, low area III, passed southeastward south of Newfoundland, one was central south of the Grand Banks, and the third occupied the ocean south-southeast of the Azores. By the 10th low area III had passed southeastward and united with the storm central south of the Grand Banks, and the storm southeast of the Azores had apparently moved eastward. From the 11th to the 13th low area III occupied the ocean west of the Azores. By the 14th this storm had moved northeastward to about the 40th parallel, and from the 15th to the 18th was central north of the Azores, where it was attended by hard gales. By the 19th this storm had advanced to the British Isles.

The night of the 15th low area V moved eastward south of Nova Scotia, and by the morning of the 16th had apparently moved rapidly eastward and united with the storm which occupied mid-ocean. The morning of the 17th a storm of considerable strength appeared off the south Atlantic coast, where northwest gales of force 9 to 11 were encountered in the early morning. Moving northeastward, this storm reached the 40th parallel the morning of the 18th, and during the 19th passed northeastward over Newfoundland, attended during its passage south of Newfoundland on the 18th by west to north gales of force 10. On the 21st a storm of slight energy appeared over mid-ocean, from which region it moved slowly southeastward with an apparent increase of strength, and disappeared in the direction of the Mediterranean Sea by the 25th. During the 23d low area VI disappeared north of Newfoundland. On the 27th a storm of slight energy appeared south of Newfoundland, from which position it moved slowly eastward, and at the close of the month was central northeast of the Banks of Newfoundland.

### OCEAN ICE IN APRIL.

The following table shows the southern and eastern limits of the region within which icebergs or field ice were reported for April during the last 11 years:

| Southern limit. | | | Eastern limit. | | |
|---|---|---|---|---|---|
| Month. | Lat. N. | Long. W. | Month. | Lat. N. | Long. W. |
| | ° ′ | ° ′ | | ° ′ | ° ′ |
| April, 1883 | 40 49 | 52 06 | April, 1883 | 48 00 | 43 00 |
| April, 1884 | 41 26 | 48 46 | April, 1884 | 45 25 | 43 34 |
| April, 1885 | 41 40 | 49 50 | April, 1885 | 44 10 | 39 41 |
| April, 1886 | 40 51 | 46 39 | April, 1886 | *47 43 | 39 11 |
| April, 1887 | 40 02 | 50 04 | April, 1887 | 48 00 | 38 18 |
| April, 1888 | 41 33 | 50 00 | April, 1888 | 47 40 | 49 00 |
| April, 1889 | 43 57 | 50 20 | April, 1889 | 47 16 | 43 11 |
| April, 1890 | 40 00 | 49 40 | April, 1890 | 47 26 | 35 42 |
| April, 1891 | 40 01 | 48 24 | April, 1891 | 45 33 | 43 32 |
| April, 1892 | 42 46 | 49 37 | April, 1892 | 48 58 | 44 27 |
| April, 1893 | 42 28 | 50 14 | April, 1893 | 46 50 | 46 05 |
| Mean | 41 25 | 49 37 | Mean | 47 00 | 41 31 |

*Isolated iceberg.

The limits of the region within which icebergs or field ice were reported for April, 1893, are shown on Chart I by ruled shading. The southernmost ice reported, small patches of field ice, observed on the 21st in the position given, was about 1° north of the average southern limit, and the easternmost ice reported, small bergs on the 26th in the position given, was about 4½° west of the average western limit of ice for April. No ice was reported during the first half of the month, and that noted at intervals from the 17th to the 29th was encountered near the east edge of the Banks of Newfoundland.

### OCEAN FOG FOR APRIL.

The limits of fog belts west of the 40th meridian, as reported by shipmasters, are shown on Chart I by dotted shading. East of the 55th meridian fog was reported on 14 dates; between the 55th and 65th meridians on 19 dates; and west of the 65th meridian on 10 dates. East of the 55th and west of the 65th meridians the dates of occurrence of fog corresponded in number with the average for April for the last 5 years; between the 55th and 65th meridians the number of foggy days numbered 9 greater than the average. The occurrence of fog along the steamship tracks west of the 40th meridian and at stations of the Weather Bureau on the middle Atlantic and New England coasts generally attended the approach or passage of general storms.

## TEMPERATURE OF THE AIR (expressed in degrees Fahrenheit).

The distribution of mean temperature over the United States and Canada for April, 1893, is exhibited on Chart II by dotted isotherms. In the table of miscellaneous meteorological data the monthly mean temperature and the departure from the normal are given for regular stations of the Weather Bureau. The figures opposite the names of the geographical districts in the columns for mean temperature and departure from the normal show, respectively, the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the temperature is below the normal and subtracting when above. The monthly mean temperature for regular stations of the Weather Bureau represents the mean of the maximum and minimum temperatures.

The mean temperature was highest in the Colorado Desert, Cal., and over extreme southern Florida, where it was above 75, and the mean values were above 70 in Florida, southern Georgia, southern Mississippi, southern Louisiana, central and southern Texas, and in the Gila and lower Colorado valleys. South of a line traced from North Carolina to extreme northwestern Texas, thence to extreme southern New Mexico, thence to extreme southern Nevada, and thence to extreme south-central California the mean temperature was above 60. The lowest mean temperature was noted at mountain stations in Colorado, and north of a line traced from extreme northern upper Michigan over northern Minnesota and northeastern North Dakota, where it was below 40, and the mean readings were below 40 north of a line traced from the middle New England coast to western South Dakota, thence to north-central New Mexico, and thence irregularly northwestward to